REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (*Leave blank*)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	4/25/01	Interim Progress Report - 3/01 - 5/01

4. TITLE AND SUBTITLE

Sea surface micro-structure: Relation to air-sea fluxes, bubble transport and electromagnetic wave radiation

5. FUNDING NUMBERS

N00014-99-1-0191

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8. PERFORMING ORGANIZATION REPORT NUMBER

UCSD 99-1166

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Office of Naval Research
800 North Quincy Street
Arlington, VA 22217-5660

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Available to public

12b. DISTRIBUTION CODE

13. ABSTRACT (*Maximum 200 words*)

Please see attached progress report

20010613 075

14. SUBJECT TERMS

sea surface structure, dispersed capillary trains, heat flux

15. NUMBER OF PAGES

1

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	**Unclassified**	**Unclassified**	**Same as report**

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Award Number: N00014-99-1-0191
March 2001 – May 2001

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Two directions of this program have progressed.

1) Analysis of sea surface structure on the millimeter scale. Past analyses have focussed on the spectrum of waves. This approach does not provide full information because of the non-linear relations between short gravity waves and capillary waves. We are focusing on typical dispersed capillary trains and attempting to relate them to the sharp crested short gravity waves on which they ride. Some of the statistical features that need quantification are the rates of production and decay of the trains and the energy flux implied by the decay rates.

2) We are designing a system to estimate the heat flux from to ocean to the atmosphere in relation to the shortest waves. It is known that the existence of capillaries greatly increases various fluxes across the air-sea boundary, but it is not at all clear how this occurs. Several processes may be at work -- convergence/divergence of orbital motions in waves disturbs the boundary layer at the top of the water where heat flux is throttled by laminar flow. This will lead to variable temperatures at the various phases of capillary waves. Another process derives from the decay of capillary trains. This delivers horizontal momentum to the water in patches corresponding to the locations of the trains. Such a patchy driving force will encourage turbulent motions of a size corresponding to the length of the train. A third process is brought about by wind stress on short gravity waves and the capillaries. This is again a patchy forcing and should lead to a natural scale of turbulence. Surface active films on the water surface are a complicating but very important factor. We have available an infra red camera that we expect to help us identify these processes. This camera will be able to identify temperature anomalies of a few hundredths of a degree and on a spatial scale capable of discriminating capillary scale from large- scale processes. We are engaged in mounting this camera, first on a laboratory wind wave channel. Only after finding how this works will we then proceed to open sea observations.